FREQUENCY OF ISOFLURANE VAPORIZER CERTIFICATION and Scavenging

I-IC-GU-607

A. PURPOSE

To provide guidance on the frequency of certification of isoflurane vaporizers and scavenging techniques.

B. GUIDELINES

Isoflurane is a halogenated hydrocarbon that is commonly used as an anesthetic gas. Isoflurane vaporizers are supplied by a number of manufacturers but are essentially of the same design. Some manufacturers have recommended service intervals, while some do not. Annual recertification of an isoflurane vaporizer most often does not require recalibration or repair.

Annual recertification places an undue financial burden on researchers and does not significantly contribute to efficacy or safe operation. This guidance allows for a triennial recertification, providing the isoflurane vaporizer meets the performance standard for efficacy and the unit is operating in a safe manner.

Unlike isoflurane, halothane can damage vaporizer parts. This guidance does not pertain to vaporizers in which any halogenated hydrocarbon anesthetic gas other than isoflurane is used.

Performance Standard for Efficacy:
Isoflurane is commonly delivered as 1-5% in air or O_2, as a carrier gas. In small animals, the depth of anesthesia is monitored by observing the response to toe pinch, the respiration rate/pattern, the color of the mucus membranes and/or movement of the whiskers. Animals may also be instrumented such that respiration and heart rate are continuously measured. Based on these observations/measurements, the depth of anesthesia is controlled by adjusting the amount of isoflurane gas, e.g., 3-5% for induction and 2-2.5% for maintenance of anesthesia. The dose of isoflurane is thus adjusted to effect as measured by its performance to cause the appropriate depth of anesthesia.

Mandatory Recertification Interval:
The IACUC have determined that isoflurane vaporizer recertification must occur triennially, i.e., a vaporizer must be recertified at an interval of no more than three years after its first use, and no more than every three years after that.

If the isoflurane vaporizer does not meet the performance standard above, at any time within the three-year time period, use of the vaporizer must cease until it is recalibrated, repaired and/or recertified.

Safe Operation:
Exposure to isoflurane is not without health risks, and incorrect use can expose human workers to waste anesthetic gas. There is no current limit for isoflurane exposure. However, the recommended safe limit is 2 ppm for one hour, which is well below the detectable threshold by smell. Waste gas exposure can occur by:

- Leakage around a loose-fitting nose cone or face mask
- Opening the induction chamber to retrieve an animal
- Lack of a non-rebreathing system
- Release of isoflurane in the breath of an animal recovering from anesthesia
- Leakage from any of the vaporizer fittings/tubing

Scavenging

The safest and preferred method is to perform all isoflurane activities with an active scavenging system such as a chemical fume hood or a vacuum snorkel. If active scavenging is not practical, waste gas must be passively

scavenged with a charcoal filter. The charcoal canister will absorb and remove the gas through passive scavenging. Charcoal canisters have a finite effective life span, which must be monitored by weight.

- The weight of each new canister should be recorded before its first use.
- Before each subsequent use, the weight should be checked and recorded. If actively using, canisters should be weighed weekly or monthly (depending on use).
- If the total increase is close to the manufacturer specified limits (e.g. 50g above original weight), the canister should be monitored and weighed more closely. Once the canister reaches the manufacturer limits, the canister should be replaced.
- To function properly, the canister must be at a level below that of the vaporizer and in the upright/vertical position. This will assist passive scavenging.
- To ensure adequate air flow, the holes on the bottom or top of the canister (if applicable, depending on brand) must not be blocked.

Labelling
The vaporizer should have a label or sticker indicating the last date of recalibration or recertification. If a label or sticker is not available on the unit, records must be provided upon IACUC request indicating the last date of service.

New vaporizers should be labelled with the date the unit was first put into service to determine when the first triennial recertification is due. Records of use may be used in lieu of labelling and must be provided upon IACUC request.

C. REFERENCES, MATERIALS, AND/OR ADDITIONAL INFORMATION

- Waste Anesthetic Gases–Occupational Hazards in Hospitals, DHHS (NIOSH) Publication Number 2007-151 http://www.cdc.gov/niosh/docs/2007-151/pdfs/2007-151.pdf